CHEM 554 – Drug Discovery at the Interface of Chemistry and Biology

Spring 2019

Course description:

Drug Discovery requires a close integration of chemistry and biology. Advances in chemical biology provide both fundamental scientific insights and practical applications in drug discovery. This course explores the design and development of new medicine from a chemical biology perspective. Topics include traditional drug discovery from plant and animal origins, synthesis and engineering of hybrid chemical/biologic drugs, novel immune therapy.

There is no required textbook for this class. Material covered in lectures and supplementary reading will be the focus of the course. Reading lists will be distributed each week.

Instructor details:

Professor: Han Xiao

Communication with Professor Xiao: han.xiao@rice.edu

Course website: All PowerPoint slides and various course materials will be posted at our course web site on Canvas, as well as class announcements, so check frequently. URL: https://canvas.rice.edu

Lectures: TR 9:25-10:40 am in WSC 146

Exams: There is a final at the end of the class.

Topics covered, in their approximate order by week

1. Small Molecule Drug—Anticancer drugs

    - Drugs acting on nucleic acids
    - Drugs acting on enzymes
    - Inhibitors of signaling pathways
    - Drugs on the structural proteins

2. Protein Drug—Antibody Drug Conjugate

    - ADC 1.0—BR96-Dox
    - ADC 2.0—Mylotarg
    - ADC 3.0—Adcetris
    - ADC 4.0—T-DM1

3. Cancer Immunotherapy

    - CAR-T therapy
    - Dendritic cell-based vaccine
    - Checkpoint inhibitors
    - Comparison of different immunotherapies

4. Small Molecule Drug—Antibacterial drugs

    - Inhibition of bacterial cell wall synthesis
    - Inhibition of cell metabolism
    - Inhibition of protein synthesis
    - Inhibition of nucleic acid transcription and replication
    - Interaction with the plasma membrane

5. Oligonucleotide Therapeutics

    - Antisense therapy (RNAi, dsRNase, RNase H)
    - Oligonucleotide Drugs
    - Delivery of therapeutic oligonucleotides

6. Small Molecule Drug—Antiviral drugs

    - DNA vs RNA viruses
    - Drugs against DNA virus
    - Drugs against RNA virus